

Irwin I. Puc, PhD

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Summary

Dr. Puc holds a PhD in Medical Sciences and a Master's degree in Microbiology and Immunology from National Cheng Kung University, Taiwan. His expertise has been shaped through both his PhD and postdoctoral training, spanning viral pathogenesis, host-virus interactions, immunology, chronic inflammation, mucosal malignancies, immuno-oncology and unconventional T cell biology. His education and training have given him hands-on experience and conceptual skills in academic teaching and student mentoring, at a university graduate level. He possesses a solid understanding of Bench-to-Bedside Clinical and Transactional Research practices, with the ability to design, execute, and communicate research projects independently or collaboratively, with collaborators from both academic and non-academic sectors. As a motivated and passionate researcher, his long-term goal is to advance the field by exploring new insights into the interplay between immune responses and disease progression, and to leverage this knowledge to develop novel therapeutic strategies.

Core competencies

Research Interest: T-B Cell Immunology, Cancer & Infectious Disease Immunology, Metabolic Disease, Single-cell Technologies, Spatial Transcriptomics, Immune regulation and disease, High-Dimensional Immune Profiling, Data Analysis & Bioinformatics

Personal qualities: Team Player, Communication, Critical Thinker, Problem Solving, Multitasking, Time Efficient, Adaptability

Language: English (native), Spanish (native), Mandarin Chinese (professional working proficiency)

Coding: R, Model Evaluation: ROC analysis, Tree-based models (Decision Trees, Random Forests), FlowCore, Seurat Packages, HTML, CSS

Experimental techniques/assays: Mass-Cytometry (CyTOF), Flow Cytometry, Tetramer/Antibody Conjugation, Confocal Microscopy, Proteomics, scRNA-seq, RNA Interference, Laboratory techniques (Cell Culture, Handling/processing Human Clinical Samples, ELISA, CO-IP, RT-PCR, Western blot), Mouse Handling, Molecular Cloning, High-dimensional Data Analysis and Visualization.

Professional Experience

Postdoctoral Fellow

Academia Sinica, Institute of Biomedical Science

Trained in high-dimensional tissue-specific immune profiling and rare antigen-specific T cell analysis; advised by Dr. Cheng Yang

Taipei, Taiwan

Jul 2023 - Jul 2025

- Investigated the roles of conventional and unconventional T cells in the chronic HBV infection, HBV-associated liver disease and liver cancer.
- Investigated CD1d-restricted iNKT and MR1-restricted MAIT cells across human tissues using tetramer staining and mass cytometry, to assess their functional states and immunological roles.
- Developed lipid-loaded tetramers and Endo-tetamers to study rare CD1a/b/c-restricted iNKT cells and assess their functional states and immunological roles in psoriasis, polycythemia vera, and liver cancer.
- Investigated the role and phenotypic profiles of myeloid cells in patients with chronic rhinitis, with an emphasis on distinguishing type 2 versus non-type 2 inflammation and understanding how immune responses to environmental allergens drive airway inflammation.
- Established and optimized comprehensive antibody panel tailored for high-dimensional analysis using the CyTOF system, facilitating the precise quantification and characterization of immune cell populations and their phenotypic markers.
- Generated preliminary data for grant applications, contributing to the development of research proposals for the securing of funding for ongoing projects and fostering collaborative research opportunities.
- Implemented and optimized new experimental protocols for laboratory use, enhancing the efficiency and reproducibility of immunological assays and data collection.

Researcher & Laboratory Assistant

National Cheng Kung University, Institute of Basic Medical Sciences

Trained in viral immunology, stem cell dynamics in dengue, predictive modeling, and biomarker discovery in dengue pathogenesis; advised by Prof. Oscar Guey-Chuen Perng†.

Tainan, Taiwan

Jan 2019 - Jun 2023

- Investigated cytokine signatures in dengue patients across different disease severities and used predictive modeling to identify severity biomarkers.
- Investigated dengue virus entry receptors in hematopoietic stem and progenitor cell populations using proteomics, binding assays and receptor-blocking experiments.
- Investigated the mobilization, functional capacity, and latent viral potential of hematopoietic stem and progenitor cells in dengue patients and in vertical transmission during pregnancy.
- Implemented new experiment protocols for lab use.
- Designed and prepared new experiment for preliminary data for grant applications.
- Maintained laboratory equipment and reagent inventory, ensuring that all supplies were available and in good working order.
- Trained and supervised new laboratory members, providing guidance on experimental techniques and safety protocols.
- Preparation of scientific papers, reports and English editing.

Researcher Assistant

University of Belize Micro-propagation Research Laboratory

Supervised by Dr. Stephen Williams

Belmopan, Belize

Aug 2013 - Aug 2015

- Perform laboratory experiments.
- Execute new protocols for more efficient propagation.
- Maintained laboratory equipment and reagent inventory, ensuring that all supplies were available and in good working order.
- Maintained database of: expenses, materials and study data.
- Trained and supervised new laboratory members, providing guidance on experimental techniques and safety protocols.

Techning Experience

Teaching Practicum / Guest Lecturer

National Cheng Kung University

Teaching opportunity provided by Prof. Oscar Guey-Chuen Perng to gain hands-on experience in academic teaching under his mentorship.

1. Introduction to Translational Medicine (Course No. S452300)
Graduate Program, Semester 2
 - Module 2: Introduction to Translational Medicine
 - Module 4: Conflict of Interest
 - Module 15: Clinical Operation through Data Visualization
 - Module 16: Ethics of Human Research
2. Research Integrity (Course No. S452500)
Graduate Program, Semester 1
 - Module 3: Data Management and Sharing.

Tainan, Taiwan
Fall Semester 2020

Tainan, Taiwan
Spring Semester 2021

Education

Ph.D in Basic Medical Sciences

National Cheng Kung University

Thesis title: Longitudinal analysis of cytokine and hematopoietic stem cells mobilization profiling in subsequent dengue infection.

Advisor: Prof. Oscar Guey-Chuen Perng[†] & Co-Advisor Prof. Shaw-Jenq Tsai

Tainan, Taiwan
Jan 2019 - Jun 2023

M.Sc in Microbiology and Immunology

National Cheng Kung University

Thesis title: Skin stem cells are highly permissive to dengue virus infection.

Advisor: Prof. Oscar Guey-Chuen Perng[†]

Tainan, Taiwan
Aug 2016 - Jan 2019

B.S in Biology

University of Belize

Thesis title: Effects of four different capping systems in the micropropagation of sugarcane (*Saccharum officinarum*) Variety B79-474.

Advisor: Dr. Dion Daniels

Belmopan, Belize
Jan 2011 - Jun 2015

A.S in Computer Science

University of Belize

Belmopan, Belize
Jan 2011 - Jun 2013

Publications

1. Vats, Amrita; Ho, Tzu-Chuan; [Puc, Irwin](#); Chang, Chiung-Hsin; Perng, Guey Chuen; Chen, Po-Lin. 2023. *The CD133 and CD34 cell types in human umbilical cord blood have the capacity to produce infectious dengue virus particles*. Scientific Reports. DOI:[10.1038/s41598-023-37707-8](#)
2. [Puc, Irwin](#); Ho, Tzu-Chuan; Chien, Yu-Wen; Tan, Sia-Seng; Fong, Yu-Cin; Yen, Ko-Lun; Chen, Yi-Ju; Wang, Sheng-Hsuan; Li, Yun-Hsuan; Chen, Po-Lin; Perng, Guey Chuen; Tsai, Jih-Jin. 2022. *Mobilizing capacity of hematopoietic stem and progenitor cells during dengue virus infection*. International Journal of Molecular Sciences. DOI:[10.3390/ijms232214330](#)
3. Chen, Yi-Ju; Ho, Tsao - Yu-Cian; Ho, Tzu-Chuan, [Puc, Irwin](#); Chen, Chia-Chang, Perng, Guey Chuen. 2022. *Antrodia cinnamomea Suppress Dengue Virus Infection through Enhancing the Secretion of Interferon-Alpha*. Plants. DOI:[10.3390/plants11192631](#)
4. Vats, Amrita; Ho, Tzu-Chuan; [Puc, Irwin](#); Chen, Yi-Ju; Chang, Chiung-Hsin; Chien, Yu-Wen; Yen, Ko-Lun; Perng, Guey Chuen. 2021. *Evidence that hematopoietic stem cells in human umbilical cord blood is infectable by dengue virus: proposing a vertical transmission candidate*. Heliyon. DOI:[10.1016/j.heliyon.2021.e06785](#)
5. [Puc, Irwin](#); Ho, Tzu-Chuan; Yen, Ko-Lun; Vats, Amrita; Tsai, Jih-Jin; Chen, Po-Lin; Chen, Yu-Wen; Lo, Yu-Chih; Perng, Guey Chuen. 2021. *Cytokine Signature of Dengue Patients at Different Severity of the Disease*. International Journal of Molecular Sciences. DOI:[10.3390/ijms22062879](#)
6. [Puc, Irwin](#); Alegria, Javier; Dion, Daniels; Guerra, Daniels; Williams, Stephan. 2017. *Effects of Four Different Capping Systems in the Micropropagation of Sugarcane (Saccharum officinarum) Variety B79-474*. International Journal of Scientific Engineering and Research. DOI:[10.13140/RG.2.2.10699.49440](#)

Patents

- 1. Use of dengue virus for preparing anti-hepatoma drug. Taiwan Patent No.:[TWI873401B](#). Date Issued: February 21, 2025.
 - Description: A method for treating hepatoma using dengue viruses that selectively infect and eliminate liver tumor stem cells

Peer Review Activities

- Reviewer, Scientific Reports (Nature Portfolio)
- Reviewer, BMC Infectious Diseases (Springer Nature)
- Reviewer, Discover Viruses (Springer Nature)

Honors and Awards

- The Chung Hwa Rotary Educational Foundation Taiwan Rotary Academic Scholarship (2022-2023)
 - Awarded for academic excellence and commitment to leadership and community service, supporting outstanding international graduate students in Taiwan.
- The Chung Hwa Rotary Educational Foundation Taiwan Rotary Academic Scholarship (2020-2021)
 - Awarded for academic excellence and commitment to leadership and community service, supporting outstanding international graduate students in Taiwan.
- NCKU Distinguished Scholarship (2019-2023)
 - Competitive merit-based scholarship granted annually to top-performing graduate students for sustained academic achievement and research excellence.
- MOFA Taiwan Scholarship (2015-2018)
 - Prestigious, fully funded government scholarship awarded to only five top Belizean students per year based on academic excellence and leadership potential, supporting graduate study in Taiwan.

Certificates and Training

Standard BioTools™ - CyTOF XT Core Operator Training

- XT101 and 201 Training Course (2023)
 - Gained hands-on experience in mass cytometry operation, quality control and instrument maintenance, with advanced training in troubleshooting, optimization, data cleanup and batch effect management.

National Cheng Kung University IRB Training Programme

- Preparation for Investigator-Initiated Trials (2019)
 - Gained practical understanding of designing, submitting, and managing investigator-led clinical research while ensuring ethical compliance and regulatory standards.
- The Design, Operation, and Risk Management of Clinical Trials (2019)
 - Trained in planning, executing, and monitoring clinical trials with an emphasis on identifying and mitigating operational and ethical risks.
- Early Phase Clinical Trial Design (2017)
 - Focused on the principles and challenges of designing first-in-human and dose-escalation studies in early-stage clinical research.
- Investigational Product Development and the FDA (2017)
 - Acquired foundational knowledge in investigational new drug (IND) application processes, FDA regulations, and product development pathways from lab to clinic.

Personal Data

- Full Name: Irwin Ivandi Puc Chulin
- Nationality: Mexican/Belizean
- Gender: Male
- Marital Status: Married
- Personal Email: irwin.i.puc@gmail.com